



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,881	01/18/2006	Kozo Takatsu	274437US0PCT	1795
22850	7590	09/01/2010	EXAMINER	
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P.			SINGH, PREM C	
1940 DUKE STREET			ART UNIT	PAPER NUMBER
ALEXANDRIA, VA 22314			1797	
NOTIFICATION DATE		DELIVERY MODE		
09/01/2010		ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com  
oblonpat@oblon.com  
jgardner@oblon.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/540,881	<b>Applicant(s)</b> TAKATSU ET AL.
	<b>Examiner</b> PREM C. SINGH	<b>Art Unit</b> 1797

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If no period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 24 August 2010.  
 2a) This action is FINAL.      2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1-4 and 7-16 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-4 and 7-16 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) Notice of References Cited (PTO-892)  
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)  
 3) Information Disclosure Statement (PTO/GS-68)  
 Paper No(s)/Mail Date 07/21/2010

4) Interview Summary (PTO-413)  
 Paper No(s)/Mail Date: \_\_\_\_\_  
 5) Notice of Informal Patent Application  
 6) Other: \_\_\_\_\_

**DETAILED ACTION**

1. Applicant's remarks and arguments in response to the Office action dated: 02/25/2010 are noted.

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-4 and 7-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takashi et al (Japanese Patent Abstract No: 2001-278602) ("Takashi") in view of Satokawa et al (US 2001/0014304 A1) ("Satokawa").

4. With respect to claims 1, 4 and 16, Takashi discloses removal of sulfur compounds from a petroleum system hydrocarbon feed by first contacting the feed with a first adsorbent (it is to be noted that Takashi uses the term "devulcanizing agent" for desulfurization agent) to remove benzothiophenes or dibenzothiophenes and then with a second adsorbent to remove mercaptans, thiophenes, dibenzothiophenes, sulfides, and disulfides (See paragraph 0004 and 0005).

Takashi discloses a desulfurizing agent A comprising a Group 17 element supported on a zeolite (See paragraph 0008).

Takashi also discloses that for the second adsorbent (desulfurizing agent B), there is especially no limit, it may use another desulfurizing agent and may use hydrodesulfurization catalysts such as Co-Mo/Alumina and Ni-Mo/Alumina (See paragraph 0010). It is to be noted that Co-Mo/Alumina and Ni-Mo/Alumina are metal component-carried on a porous inorganic oxide.

Takashi discloses LPG, gasoline, naphtha, kerosene, and gas oil as the preferred petroleum system hydrocarbons (See paragraph 0008).

Takashi invention does not appear to specifically disclose the claimed metals carried on zeolite beta and/or faujasite as agent A.

Satokawa invention discloses a process for desulfurization of hydrocarbon feed (See paragraph 0004, 0027; claim 10) similar to Takashi under similar operating conditions (See paragraph 0026) using Y- and beta-zeolites (See paragraph 0023). Satokawa also discloses that by using one or more transition metals selected from silver, copper, zinc, iron, cobalt, and nickel supported on zeolite, improves the adsorption characteristics of sulfur compounds irrespective of the moisture in the fuel gas (See paragraph 0030, 0032). This indicates that a Group 17 element supported on a zeolite, used in Takashi invention, and transition metals supported on a zeolite, used in Satokawa invention, are functionally similar in the desulfurization process.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of invention to modify Takashi invention and use the transition metal supported zeolite as the desulfurizing agent A, as disclosed by Satokawa, for an improved desulfurization.

5. With respect to claim 2, Takashi does not appear to specifically disclose that the desulfurizing agent A has higher desulfurizing performance to sulfides and disulfides

than desulfurizing agent B and desulfurizing agent B has a higher desulfurizing performance to carbonyl sulfide than that of desulfurizing agent A. However, since combined invention of Takashi and Satokawa uses a feed and desulfurizing agents A and B similar to the Applicant's claim, the combined invention should necessarily be achieving similar performance of desulfurizing agents A and B as claimed.

6. With respect to claim 3, Takashi invention does not appear to specifically disclose the volume ratio of desulfurizing agents A and B, however, it would have been obvious to one with ordinary skill in the art at the time of invention to specify the volume ratio of desulfurizing agents A and B in the modified Takashi invention which is expected to be in a range as claimed, because Takashi in view of Satokawa uses agents similar to the Applicant's claim.

7. With respect to claim 7, Takashi invention discloses temperature of the desulfurizing bed to be from -40 to 100°C (See paragraph 0009).

8. With respect to claims 8 and 9, Takashi invention discloses LPG and naphtha fraction as hydrocarbon containing gas for fuel cell (See paragraph 0008).

Takashi invention does not specifically disclose LPG and naphtha containing less than 0.1 weight ppm carbonyl sulfide. However, the invention does disclose that total sulfur content must be below 0.2 weight ppm (See paragraph 0002, 0011). Since Takashi's disclosure of total sulfur content includes mercaptans, thiophenes,

benzothiophenes, dibenzothiophenes, sulfides, and disulfides (See paragraph 0005), it should necessarily include carbonyl sulfide also. When the concentration of all sulfur compounds is below 0.2 weight ppm, clearly, the concentration of carbonyl sulfide must be below 0.1 weight ppm.

9. With respect to claim 10, modified Takashi invention discloses desulfurization of LPG and naphtha fraction by using a desulfurizing agent comprising a zeolite (See Takashi, paragraph 0008; Satokawa, paragraph 0023).

10. With respect to claims 11 and 14, Takashi invention discloses a process for producing hydrogen for a fuel cell by contacting the petroleum system hydrocarbon (LPG, gasoline, naphtha, kerosene) after conducting the desulfurization process of the invention, with a steam reforming catalyst (See paragraph 0012).

11. With respect to claims 12 and 15, Takashi invention discloses using ruthenium base or nickel base catalyst for steam reforming (See paragraph 0012).

***Response to Arguments***

12. Applicant's arguments filed 08/24/2010 have been fully considered but they are not persuasive.

13. In the arguments on page 7-8, the Applicant argues that:

Takashi describes the function of the halogen (Bromine) is to form a sulfur bromide which is more easily adsorbed than benzothiophenes and dibenzothiophenes and therefore removed by a porous adsorbent [0007]. Satokawa describes a zeolite ion-exchanged with one or more transition metals as an adsorbent for removing sulfur compounds such as sulfides, thiophenes or mercaptans, from fuel gas (Abstract). The Office alleges that the first desulphurization agent of Takashi and the zeolite ion-exchanged with a transition metal of Satokawa are "functionally similar in the desulfurization process" because both references indicate that the two different agents are able to perform in the presence of moisture. Applicants submit that the Office continues to fail to recognize the mode of operation of the Takashi agent which is described in [0007]. Takashi requires a halogenation of the sulfur in the organic structure to render the compound more efficiently adsorbed. Applicants submit that one of ordinary skill in the art would recognize the significant differences of the two agents and not make the combination the Office has alleged.

In response, it is the examiner's position that Takashi uses a desulfurizing agent A comprising bromine, supported on zeolite and a desulfurizing agent B comprising Co-Mo/alumina and Ni-Mo/alumina (See paragraph 0007, 0008, 0010) to remove sulfur compounds from hydrocarbon feed streams. Takashi also discloses that the agent A is effective for removing benzothiophene and dibenzothiophene (See paragraph 0005).

Satokawa discloses using desulfurizing agent A comprising, "Transition metals selected from silver (Ag), copper (Cu), zinc (Zn), iron (Fe), cobalt (Co) and nickel (Ni) be supported on a zeolite through ion exchange. In the invention, it is favorable to use, as the zeolite, any of X-type zeolites, Y-type zeolites and beta-type zeolites among a diversity of existing zeolites" (Paragraph 0023). Satokawa also discloses using Co-Mo catalyst and agent such as zinc oxide and iron oxide (See paragraph 0007). Satokawa further discloses that the adsorbent of the invention (agent A) functions at or in the vicinity of normal temperatures without resorting to the additional application of heat, thus making a device structure and operations simple (See paragraph 0031). Satokawa also discloses that sulfur compounds including not only DMS, but also sulfides, mercaptans, thiophenes and the like can be effectively, simultaneously removed from fuel gases containing such sulfur compounds (See paragraph 0032).

In view of Satokawa teaching that transition metal supported on a zeolite is functional near normal temperatures and does not require additional heating, and the adsorbent is effective in removing different types of sulfur compounds, it would have been obvious to one with ordinary skill in the art at the time of invention to modify Takashi invention and use desulfurizing agent A as disclosed by Satokawa to avoid any additional heating and removing in addition to thiophenes, other sulfur compounds also. "It is *prima facie* obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose" *In re Kerkhoven*, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980). An express suggestion to substitute one equivalent component or

process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). It is to be noted that the mechanism of reaction of bromine with the sulfur compounds does not negate the Takashi's agent (bromine supported on zeolite) to be substituted by a functionally similar Satokawa's agent (transition metals supported on zeolite), because both agents are desulfurizing agents intended for the same purpose. Additionally, one with ordinary skill in the art would use the latter because it can be used near normal temperatures and is effective for removing different types of sulfur compounds.

14. In the arguments on page 8, the Applicant argues that:

Applicants further note that Satokawa corresponds to JP 2001-286753 which is described in the specification on page 4, lines 1-8, as not effective for the absorption of carbonyl sulfide. Moreover, Applicants submit that the data shown in Table demonstrates a synergistic improvement in desulfurization is obtained by the combination of agents A and B according to the invention. Applicants note that Comp. 1 corresponds to the desulfurizing agent described by Satokawa and Example 1 is a catalyst according to the invention which is a combination of the two comparative example agents. As indicated in the table, the desulfurizing agent according to the invention is effective for removal of COS and DMDS for significantly longer time than would be expected based on the individual components and shows a synergistic improvement. Applicants submit that such a

showing of greater than expected results is evidence of nonobviousness which supports the patentability of the present invention.

In response, it is the examiner's position that the Table shows that use of either agent A or agent B is not as effective as the combination of agents A and B. Takashi clearly recognizes this synergistic effect of using both agents together. Thus, the modified Takashi invention (Takashi's agent A replaced by Satokawa's agent A) has identical combination of agents A and B as claimed and therefore, modified Takashi is expected to achieve similar performance on the removal of carbonyl sulfide (COS) and dimethyl disulfide (DMDS) as achieved by the Applicant.

15. In conclusion, the claimed invention is *prima facie* obvious over Takashi in view of Satokawa.

### ***Conclusion***

16. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prem C. Singh whose telephone number is 571-272-6381. The examiner can normally be reached on 7:00 AM to 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.